

REMARKS

Reconsideration and allowance is respectfully requested.

I. Status of the Claims

Claims 2-27 are pending. Claim 1 was previously canceled. Claim 2 has been amended to correct the capitalization of FCC. No new matter has been added.

Claims 4-26 were previously withdrawn from consideration.

Claim 27 has been canceled without prejudice or disclaimer.

II. Rejections under 35 U.S.C. § 112

Claim 27 is rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Claim 27 has been canceled, therefore, this rejection is now moot.

III. Rejections Under 35 U.S.C. § 103

Claims 2, 3 and 27 are rejected under 35 U.S.C. §103(a) as being unpatentable over Japanese Patent Publication No. JP 06-128671 to Kazuo Yamanaka et al. ("Yamanaka"). Applicant respectfully traverses the rejections under 35 U.S.C. §103(a).

With respect to claim 2, the present invention is a Ni based alloy with excellent corrosion resistance relative to supercritical water environments containing inorganic acids, consisting of in weight basis:

Cr: more than 43% and 50% or less; Mo: 0.1% to 2%; Mg: 0.001% to 0.05%; N: 0.001% to 0.04%; Mn: 0.05% to 0.5%; at least one of Fe: 0.05% to 1.0% and Si: 0.01% to 0.1%; a remainder as Ni; and unavoidable impurities, wherein a quantity of C amongst said unavoidable impurities is restricted to 0.05% or less, and the Ni based alloy consists essentially of a stabilized Ni-FCC matrix.

On the other hand, the invention of Yamanaka is an alloy with stress corrosion cracking resistance, comprising:

C: 0.07% or less, Si: 1.0% or less, Mn: 1.0% or less, Cr: 38 to 45%, Ni: 40 to 57%, Al: 0.5% or less, Ti: 0.5% or less, Mg: 0.1% or less, at least one of Mo, W and V: 0.5 to 5.0% in total added according to need, and Fe and unavoidable impurities as a remainder.

The Examiner states that claims 2-3 are rejected on the same grounds as indicated in the May 4, 2007 Office Action. In the Office Action of May 4, the Examiner argues that Yamanaka discloses a nickel-based alloy consisting of 38-45 weight percent chromium; 0.5-5.0 weight percent, in total, of one or more of molybdenum, tungsten, and vanadium; up to 0.1 weight percent magnesium; up to 1.0 weight percent manganese; up to 1.0 weight percent silicon; and up to 0.07 weight percent carbon; 40-57 weight percent nickel; and the balance iron (greater than 0-21.5 weight percent), which overlaps the claimed amounts of chromium, molybdenum, magnesium, manganese, silicon, carbon, and iron, which is a prima facie case of obviousness. The Examiner asserts that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to select the desired amounts of the elements from the ranges of elements disclosed by [Yamanaka]." The Examiner further asserts that "the alloy of [Yamanaka] would have such properties because [Yamanaka] disclose substantially the same composition as that of the claimed invention."

Applicant respectfully disagrees with the Examiner's assertion that one of skill in the art would expect similar properties to those exhibited by Applicant's claimed invention from the composition disclosed by Yamanaka. One of the features of the present invention is to contain Mo within the range from 0.1 to 2%, thereby obtaining the strong effect of improving corrosion resistance to supercritical water environments containing phosphoric acid (see page 9, lines 11-13 of Applicant's specification). This effect manifests at Mo quantities of at least 0.1%, although at quantities exceeding 2% the phase stability tends to deteriorate (see page 9, lines 13-15, and Examples).

On the other hand, in Yamanaka's alloy, Mo is not an indispensable component, but just an optional (selective) component. Therefore, Yamanaka's disclosure is directly relevant to the

present invention only with respect to examples teaching an alloy having Mo within the range claimed by Applicant's claim 2.

The examples of Yamanaka are summarized in the Table below. From the Table, it is clear that, whether the content of Mo is within or outside the range of claim 2 of the present invention, all of Si, Cr and Fe are beyond the range of claim 2 in Yamanaka.

	C	Si	Mn	P	S	Ni	Cr	Ti	Al	Mg	Mo	W	V	N	Fe
Example 3	0.022	0.41	<i>0.46</i>	0.01	0.001	<i>50.63</i>	39.15	0.25	0.14	<i>0.04</i>	<i>0.64</i>	0	0	<i>0.013</i>	8.234
Example 4	<i>0.025</i>	0.38	0.52	0.009	0.002	<i>50.88</i>	39.63	0.26	0.15	<i>0.04</i>	2.66	0	0	<i>0.028</i>	5.416
Example 5	<i>0.02</i>	0.36	0.55	0.00	0.001	<i>50.28</i>	39.46	0.23	0.13	<i>0.05</i>	4.5	0	0	<i>0.022</i>	4.388
Example 12	<i>0.021</i>	0.39	0.51	0.008	0.001	<i>50.26</i>	40.01	0.3	0.14	0.06	<i>0.29</i>	0.3	0	<i>0.029</i>	7.681
Example 14	<i>0.024</i>	0.32	<i>0.5</i>	0.007	0.001	<i>50.02</i>	39.63	0.18	0.14	<i>0.04</i>	<i>0.31</i>	0	0.3	<i>0.026</i>	8.502
Example 15	<i>0.022</i>	0.36	<i>0.48</i>	0.007	0.001	<i>50.36</i>	40.09	0.26	0.13	<i>0.05</i>	<i>0.38</i>	0.52	0.63	<i>0.025</i>	6.685
Example 16	<i>0.019</i>	0.41	<i>0.44</i>	0.01	0.01	<i>50.26</i>	39.55	0.2	0.15	<i>0.05</i>	<i>0.24</i>	0	0	<i>0.015</i>	8.646
Example 19	<i>0.023</i>	0.44	<i>0.5</i>	0.009	0.001	<i>49.92</i>	40.03	0.27	0.14	<i>0.05</i>	<i>0.11</i>	0.05	0	<i>0.018</i>	8.439
Example 21	<i>0.022</i>	0.48	<i>0.49</i>	0.013	0.001	<i>50.63</i>	39.73	0.2	0.18	<i>0.05</i>	0.08	0.09	0.1	<i>0.029</i>	7.905

Beyond the range of claim 2 (**bold**)

Within the range of claim 2 (*italics*)

This is significant, as the present invention relies on Si, Cr and Fe in amounts within the claimed ranges in order to achieve the following effects.

"Si displays a strength improvement effect at quantities of at least 0.01%, whereas quantities exceeding 0.1% result in an undesirable deterioration in the corrosion resistance relative to supercritical water environments containing inorganic acids." (page 10, lines 17-20)

"Cr is very effective in promoting corrosion resistance of the aforementioned alloy A. In order to achieve this corrosion resistant effect the quantity of Cr must exceeds 43%, although quantities exceeding 50% make processing of the alloy difficult." (page 9, lines 5-8)

"Fe displays a strength improvement effect at quantities of at least 0.05%, whereas quantities exceeding 1% result in an undesirable deterioration in the corrosion resistance relative to supercritical water environments containing inorganic acids." (page 10, lines 12-15)

In each of the examples of Yamanaka having Mo in an amount within the range claimed by Applicant in claim 2, the contents of Si, Cr and Fe are beyond the range claimed by claim 2. Therefore the above-discussed effects produced by the present invention as claimed in claim 2 are not directly obtainable by any of the examples disclosed by Yamanaka.

Further, Applicant submits that the ranges claimed by claim 2 are not obvious in view of Yamanaka. According to MPEP § 2144.05 III, Applicant "can rebut a *prima facie* case of obviousness based on overlapping ranges by showing the criticality of the claimed range." Criticality is demonstrated by showing that "there are new and unexpected results relative to the prior art." MPEP § 2144.05 III (*quoting Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1322, 73 USPQ2d 1225, 1228 (Fed. Cir. 2004)). Applicant achieved new and unexpected results associated with the invention claimed by claim 2, and submits experimental data in the attached Rule 132 declaration which demonstrates that these results are not achieved by the compositions of Yamanaka.

As described in the attached Rule 132 declaration, experiments were performed to examine the criticality of the ranges claimed by claim 2 of the present invention. Through use of flow-type corrosion test apparatuses, the tester performed corrosion tests on various Ni-based alloy sheets in an environment including supercritical water containing inorganic acids. When each of Cr, Fe, and Si are outside the range claimed by claim 2 of the present invention, significant weight reduction of the Ni-based alloy is observed. This weight reduction corresponds to the corrosion caused by the supercritical water containing inorganic acids.

In contrast, the corrosion experiments described in the patent specification demonstrate a significant difference in the amount of alloy corroded when the composition is within the ranges claimed by claim 2. See for example, Tables A1 to A3 on pages 33-35 of the specification as filed.

Specifically, Table A1, reproduced below, highlights the superior qualities that are achieved when the alloy falls within the range claimed by claim 2.

Table A1

Ni based alloy sheet	Composition (% by weight)									Corrosion tests using simulated VX gas decomposition supercritical water solution		Corrosion tests using simulated GB gas decomposition supercritical water solution		
	Cr	Mo	Mg	N	Mn	Fe	Si	C#	Ni and unavoidable impurities	weight reduction in solution test specimen (mg/cm ²)	weight reduction in aged test specimen (mg/cm ²)	weight reduction in solution test specimen (mg/cm ²)	weight reduction in aged test specimen (mg/cm ²)	
Present Invention	A1	44.0	1.00	0.008	0.021	0.07	-	-	0.02	remainder	3	4	5	6
	A2	43.1	0.31	0.006	0.008	0.22	-	-	0.02	remainder	7	7	8	8
	A3	49.7	0.45	0.007	0.011	0.13	-	-	0.03	remainder	4	8	3	9
	A4	44.2	0.12	0.011	0.021	0.28	-	-	0.02	remainder	4	6	5	7
	A5	43.2	1.96	0.021	0.013	0.10	-	-	0.02	remainder	5	7	6	8
	A6	45.6	0.46	0.001	0.014	0.09	-	-	0.01	remainder	4	6	2	4
	A7	44.0	0.36	0.049	0.002	0.14	-	-	0.02	remainder	5	9	5	9
	A8	44.5	0.35	0.022	0.039	0.12	-	-	0.02	remainder	4	6	6	7
	A9	46.5	0.47	0.006	0.022	0.05	-	-	0.02	remainder	3	5	7	9
	A10	45.1	0.49	0.008	0.025	0.49	-	-	0.01	remainder	4	6	5	8
	A11	45.6	0.48	0.031	0.018	0.13	0.05	-	0.03	remainder	5	6	6	7
	A12	43.3	0.47	0.026	0.009	0.24	0.98	-	0.02	remainder	4	7	7	9
	A13	44.4	0.48	0.017	0.022	0.17	-	0.01	0.02	remainder	3	5	6	8
	A14	44.1	0.46	0.004	0.022	0.11	-	0.09	0.02	remainder	4	6	5	7

C# refers to the C quantity incorporated as an unavoidable impurity

From the results of the experimental data produced in the attached Rule 132 declaration, it can be confirmed that, if any of Si, Cr and Fe is beyond the range claimed by claim 2, while within the range disclosed by Yamanaka, the corrosion resistance deteriorates in supercritical water environments containing inorganic acids (i.e., the observed weight reductions range from 13 to 41 mg/cm²), such that the effects achieved by the present invention cannot be achieved.

The outcome of the experiments described in the Rule 132 declaration are not surprising. Yamanaka does not teach or suggest the use of his alloy in the environments similar to those contemplated by the present invention. Yamanaka teaches that his composition can be used in lead-containing hot water and thick alkali, (i.e., basic, environments). In contrast, the present invention teaches a composition that is ideal for acidic environments.

In summary, the invention claimed by claim 2 of the present invention provides for superior corrosion resistance in supercritical water environments containing inorganic acids. It has been shown, in the case that all of the contents of Si, Cr and Fe are beyond the range claimed by claim 2, but within the range disclosed by Yamanaka, the corrosion resistance in these environments is markedly deteriorated.

Applicant submits that the ranges of amounts of Cr, Fe and Si as claimed are critical to achieve the results obtained by present invention.

For at least these reasons, Applicant submits, claim 2 of the present invention is not obvious in view of Yamanaka and stands in condition for allowance.

Accordingly, Applicant respectfully requests that the rejection of claim 2 be withdrawn.

Claim 3 depends from allowable claim 2. Accordingly, for at least this reason, Applicant respectfully requests that the rejection of claim 3 be withdrawn. As claim 27 has been canceled, Applicant submits that the rejection as to claim 27 is moot.

CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

The Examiner is respectfully requested to contact the undersigned at the telephone number indicated below if the Examiner believes any issue can be resolved through either a Supplemental Response or an Examiner's Amendment.

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Respectfully submitted,

By 

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Attachment: Declaration Under 37 C.F.R. §1.132